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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,173	10/23/2001	Krishnamurthy Vaidyanathan	US 010520	9007

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BRIARCLIFF MANOR, NY 10510

EXAMINER
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KIM, KEVIN

ART UNIT	PAPER NUMBER
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2611

MAIL DATE	DELIVERY MODE
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06/26/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/040,173

Applicant(s)

VAIDYANATHAN ET AL.

Examiner

Kevin Y. Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,3-9,12-22,24-30,33-44,46 and 48-52 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 50-52 is/are allowed.
- 6) ☒ Claim(s) 1,3,5,8,9,14-18,22,24,27,29,30,35-39,43,44,48 and 49 is/are rejected.
- 7) ☒ Claim(s) 4,6,7,12,13,19-21,25,26,28,33,34,40-42 and 46 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed June 6, 2007 have been fully considered but they are not persuasive.

Applicant states that "In Tellado, the training signal is the baseband signal. The frequency of Tellado's training sequence does not change when the carrier signal's frequency changes with each hop." It appears that applicant meant that in Malkamäki (not "In Tellado") the training signal is the baseband signal, since Tellado clearly teaches that the training signals are carrier frequencies and Malkamäki teaches an embodiment where the training sequence maybe at baseband level. The examiner responds to the applicant's remarks based on the above understanding.

Malkamäki teaches that the training signal is preferably at intermediate frequency level. See col.3, lines 16-19. Incorporating the teaching of Tellado, the intermediate frequencies of the training signal of Malkamäki would have been modified to vary in a frequency hopping manner as taught by Tellado. The frequency varying intermediate frequencies result in a likewise frequency varying carrier RF/carrier frequencies because of an upconverting operation, thus compensating for deep fading and/or interference.

### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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3. Claims 1,3,5,8,9,14-18,22,24,26,27,29,30,35-39,43,44,48,49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Malkamäki (US 6,337,855 previously cited) in view of Tellado (US 6,711,412 previously cited).

Claims 1,22.

Malkamäki discloses a system and method for improving performance of wireless communications (see Fig.3), comprising;

a transmitter producing a modulated data signal (2) that includes an addition of a supplemental signal (training sequence) within a monocarrier channel and

a receiver using the supplemental signal to compute a frequency domain channel estimate (11) for use in equalizing the channel (10) during the demodulation.

The claimed invention differs in that the supplemental signal comprises a plurality of frequencies that change during each of a plurality of periods in a predetermined sequence. In other words, the supplemental signal is frequency hopped.

Tellado teaches that carrier frequencies for a training signal can be changed in a frequency hopping manner in order to compensate for deep fading and/or interference.

See col. 8, lines 42- 53.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify the training signal of Malkamäki such that the frequencies of the training signal change in a frequency hopping manner, as taught by Tellado, for the purpose of compensating for deep fading and/or interference.

Claims 3,24.

Since the training signal of Malkamäki is supposed to be superposed on the modulated data signal, the frequencies of the training signal must be substantially the same and when modified in accordance with Tellado, the predetermined sequence should span frequencies within the channel to directly provide a frequency domain channel estimate.

Claims 5,27.

Malkamäki teaches attenuating the power of the training signal to prevent disturbance to the modulated signal. See col. 2, lines 59-65.

Claims 8,14,29,35.

Malkamäki discloses a transmitter (see Fig.3) for improved wireless communications comprising:

- a symbol source producing a data signal (data);

- a waveform generator for producing a time varying signal (training signal) that is transmitted with a power selected to avoid interference with demodulation of the data signal without reference to the signal; and

- a modulator (6) producing a transmission signal from a sum of the data signal and the training signal.

The claimed invention differs in that the time varying signal (training signal) is a time varying signal that changes frequency from one period to a subsequent period in a predetermined sequence. In other words, the time varying signal is frequency hopped.

Tellado teaches that carrier frequencies for a training signal can be changed in a frequency hopping manner in order to compensate for deep fading and/or interference.

See col. 8, lines 42- 53.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to provide a waveform generator in the Malkamäki's transmitter that produces the training signal whose the frequencies of the training signal change in a frequency hopping manner, as taught by Tellado, for the purpose of compensating for deep fading and/or interference.

Claims 9,30.

Since the training signal of Malkamäki is supposed to superposed on the modulated data signal, the frequencies of the training signal must be substantially the same and when modified in accordance with Tellado, the predetermined sequence should span frequencies within the channel to directly provide a frequency domain channel estimate.

Claims 15,36.

Malkamäki discloses a receiver and method (see Fig.3) for improved wireless communications comprising:

an equalizer (10) performing channel equalization on a received signal utilizing a channel estimate; and

a coherent demodulator (11) producing the channel estimate from the received signal and a time-varying signal corresponding to a portion of the received signal.

The claimed invention differs in that the time varying signal changes frequency from one period to a subsequent period in a predetermined sequence. In other words, the time varying signal is frequency hopped. Tellado teaches that carrier frequencies for a training signal can be changed in a frequency hopping manner in order to compensate for deep fading and/or interference. See col. 8, lines 42- 53.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to provide a waveform generator in the Malkamäki's transmitter that produces the training signal whose the frequencies of the training signal change in a frequency hopping manner, as taught by Tellado, for the purpose of compensating for deep fading and/or interference.

Claims 16,17,37,38.

Although not illustrated, the receiver requires a same waveform generator producing the time varying-signal whose period duration and the predetermined sequence match a corresponding period duration and predetermined sequence employed in generating the received signal (at the transmitter) in order to receive the frequency hopping training signal. In other words, when modified as proposed in the above

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paragraph, the receiver requires a same frequency hopping frequency generator as one that used in the transmitter.

Claim 18,39.

Since the training signal of Malkamäki is supposed to superposed on the modulated data signal, the frequencies of the training signal must be substantially the same and when modified in accordance with Tellado, the predetermined sequence should span frequencies within the channel to directly provide a frequency domain channel estimate.

Claim 43,48,49.

Malkamäki discloses a method (see Fig.3) for using a wireless communication channel signal, comprising;

providing a data signal (data) and

summing at least one supplemental signal (training sequence) with the data signal, wherein the power of the training signal is attenuated to prevent disturbance to the modulated signal. See col. 2, lines 59-65. The summed signals are the ultimate wireless communication signal.

The claimed invention differs in that the supplemental signal frequency changes during each of a plurality of periods in a predetermined sequence. In other words, the supplemental signal is frequency hopped.



Tellado teaches that a training signal has a frequency that changes in a frequency hopping manner in order to compensate for deep fading and/or interference. See col. 8, lines 42- 53.

Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify the training signal of Malkamäki such that the frequencies of the training signal change in a frequency hopping manner, as taught by Tellado, for the purpose of compensating for deep fading and/or interference.

Claim 44.

Since the training signal of Malkamäki is supposed to superposed on the modulated data signal, the frequencies of the training signal must be substantially the same and when modified in accordance with Tellado, the predetermined sequence should span frequencies within the channel to directly provide a frequency domain channel estimate.

***Allowable Subject Matter***

4. Claims 4,6,7,12,13,19,20,21,25,26,28,33,34,40,41,42,46 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
5. Claims 50-52 are allowed.

***Conclusion***

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Y. Kim whose telephone number is 571-272-3039. The examiner can normally be reached on 8AM --5PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

June 18, 2007

AU 2611

KEVIN KIM  
PRIMARY PATENT EXAMINER

